FOX SCHOOL OF BUSINESS

Options & Derivatives Overview | Spring 2019

Presented by Tyler Ascione | tascione@theowlfund.com

THE OWL FUND

A Quick Background

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Tyler Ascione

TUIA Experience:

- *President*
- *Director of Events*

Owl Fund Experience:

- *Portfolio Manager*
- *Lead Analyst, Healthcare*
- *Analyst, Energy*

Fox Fund Experience:

- *Lead Analyst, Healthcare*
- *Analyst, Financials*

Work Experience:

- Incoming Quantitative Trading Analyst at Prudential Financial, (Corporate Finance Internship for Prudential in Summer 2018)
- Resident Assistant in Morgan Hall

Agenda

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I. The Basics

II. Options Pricing

III. The Greeks

IV. Options Strategies

V. Questions

The Basics

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Derivative Securities

- Definition:
  - "A contract between parties whose value is based upon and determined by an agreed-upon underlying financial asset or security."
- Examples
  - Options, Swaps, Warrants, etc.

The Basics

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Option Styles

- Vanilla
  - American/European
- Binary – prone to fraud, banned
- Exotic – broad category, complex
- Barrier – underlying must hit barrier

Underlying Assets

- Can be literally any asset
  - Equities, bonds, commodities, futures, indices, etc.

Option Types

- Calls – give option holder the right to buy an asset
- Puts – give option holder the right to sell an asset

Contract Specifications

- Call/Put: (Call Option)
- # + Class: (50 AAPL US EQUITY)
- Strike Price: ($285.50)
- Expiry Date: (4/18/19)

The Basics

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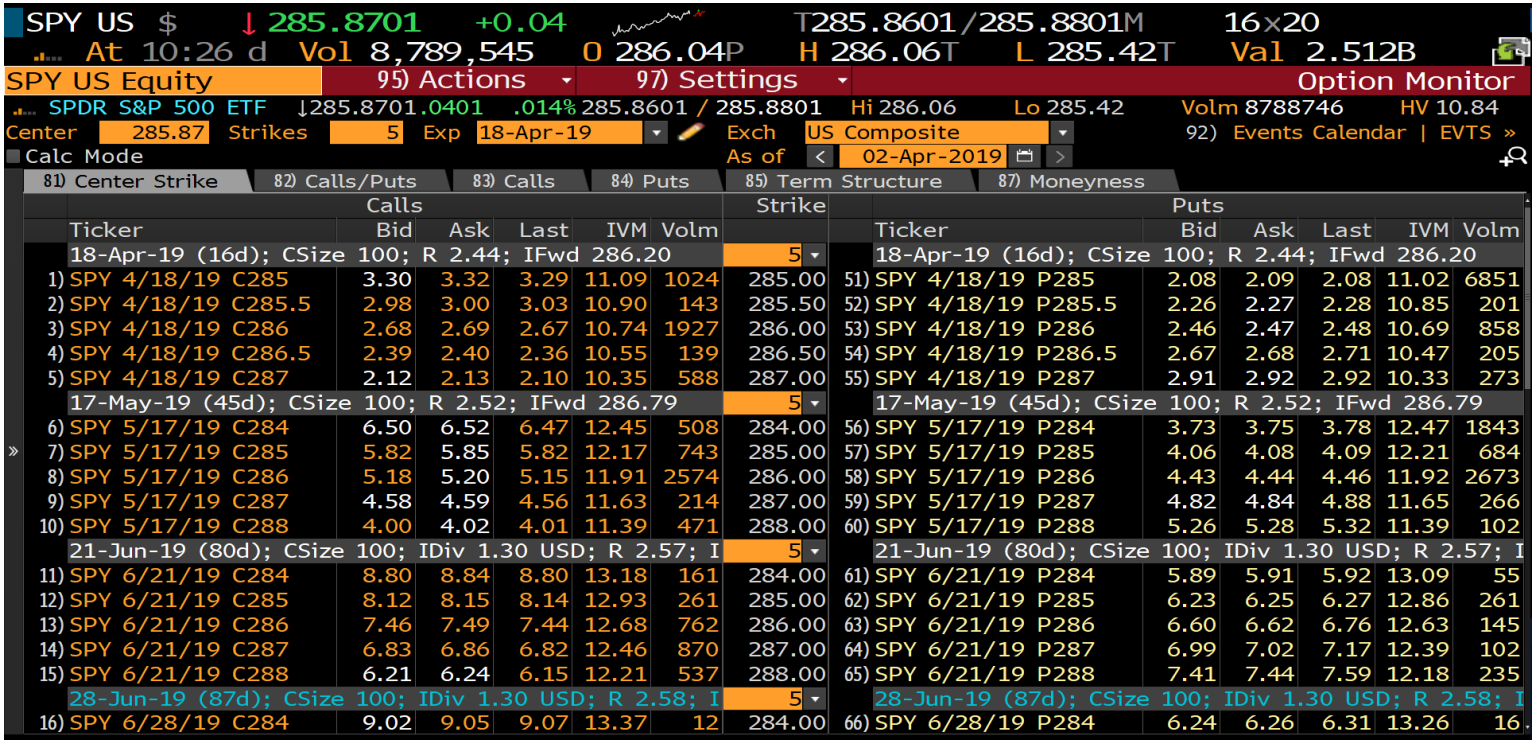
Reading Options Chains (OMON)



SPY US $ ↓ 285.8701 +0.04 T285.8601/285.8801M 16x20
At 10:26 d Vol 8,789,545 O 286.04P H 286.06T L 285.42T Val 2.512B
SPY US Equity | 95) Actions | 97) Settings | Option Monitor
SPDR S&P 500 ETF ↓285.8701.0401 .014% 285.8601 / 285.8801 Hi 286.06 Lo 285.42 Volm 8788746 HV 10.84
Center 285.87 Strikes 5 Exp 18-Apr-19 Exch US Composite 92) Events Calendar | EVTS »
Calc Mode As of 02-Apr-2019
81) Center Strike | 82) Calls/Puts | 83) Calls | 84) Puts | 85) Term Structure | 87) Moneyness

Calls						Strike	Puts					
Ticker	Bid	Ask	Last	IVM	Volm		Ticker	Bid	Ask	Last	IVM	Volm
18-Apr-19 (16d); CSize 100; R 2.44; IFwd 286.20						5	18-Apr-19 (16d); CSize 100; R 2.44; IFwd 286.20					
1) SPY 4/18/19 C285	3.30	3.32	3.29	11.09	1024	285.00	51) SPY 4/18/19 P285	2.08	2.09	2.08	11.02	6851
2) SPY 4/18/19 C285.5	2.98	3.00	3.03	10.90	143	285.50	52) SPY 4/18/19 P285.5	2.26	2.27	2.28	10.85	201
3) SPY 4/18/19 C286	2.68	2.69	2.67	10.74	1927	286.00	53) SPY 4/18/19 P286	2.46	2.47	2.48	10.69	858
4) SPY 4/18/19 C286.5	2.39	2.40	2.36	10.55	139	286.50	54) SPY 4/18/19 P286.5	2.67	2.68	2.71	10.47	205
5) SPY 4/18/19 C287	2.12	2.13	2.10	10.35	588	287.00	55) SPY 4/18/19 P287	2.91	2.92	2.92	10.33	273
17-May-19 (45d); CSize 100; R 2.52; IFwd 286.79						5	17-May-19 (45d); CSize 100; R 2.52; IFwd 286.79					
6) SPY 5/17/19 C284	6.50	6.52	6.47	12.45	508	284.00	56) SPY 5/17/19 P284	3.73	3.75	3.78	12.47	1843
7) SPY 5/17/19 C285	5.82	5.85	5.82	12.17	743	285.00	57) SPY 5/17/19 P285	4.06	4.08	4.09	12.21	684
8) SPY 5/17/19 C286	5.18	5.20	5.15	11.91	2574	286.00	58) SPY 5/17/19 P286	4.43	4.44	4.46	11.92	2673
9) SPY 5/17/19 C287	4.58	4.59	4.56	11.63	214	287.00	59) SPY 5/17/19 P287	4.82	4.84	4.88	11.65	266
10) SPY 5/17/19 C288	4.00	4.02	4.01	11.39	471	288.00	60) SPY 5/17/19 P288	5.26	5.28	5.32	11.39	102
21-Jun-19 (80d); CSize 100; IDiv 1.30 USD; R 2.57; I						5	21-Jun-19 (80d); CSize 100; IDiv 1.30 USD; R 2.57; I					
11) SPY 6/21/19 C284	8.80	8.84	8.80	13.18	161	284.00	61) SPY 6/21/19 P284	5.89	5.91	5.92	13.09	55
12) SPY 6/21/19 C285	8.12	8.15	8.14	12.93	261	285.00	62) SPY 6/21/19 P285	6.23	6.25	6.27	12.86	261
13) SPY 6/21/19 C286	7.46	7.49	7.44	12.68	762	286.00	63) SPY 6/21/19 P286	6.60	6.62	6.76	12.63	145
14) SPY 6/21/19 C287	6.83	6.86	6.82	12.46	870	287.00	64) SPY 6/21/19 P287	6.99	7.02	7.17	12.39	102
15) SPY 6/21/19 C288	6.21	6.24	6.15	12.21	537	288.00	65) SPY 6/21/19 P288	7.41	7.44	7.59	12.18	235
28-Jun-19 (87d); CSize 100; IDiv 1.30 USD; R 2.58; I						5	28-Jun-19 (87d); CSize 100; IDiv 1.30 USD; R 2.58; I					
16) SPY 6/28/19 C284	9.02	9.05	9.07	13.37	12	284.00	66) SPY 6/28/19 P284	6.24	6.26	6.31	13.26	16

Pricing Options – Before People Knew How

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Before Black Scholes

- Easy to create the risk-free rate from options strategies (long stock | short option)
- Practitioners assume stock prices follow normal distribution
- Analyst finds arbitrage in Newberger copper package (buy Gugg. | short Copper Co.)
  - Guggenheim dissolves several copper-mining companies & distributes the shares
- Thorp Finds vastly overpriced options using developed formula
  - Attempts to start hedge fund but his strategy ended him up even on the year

Black Scholes & Beyond

- Black Scholes was a "simplistic" model that did not consider all the variables
- Updates to pricing models have factored in dividends and other information
- Still not great – does not give a price

Option Pricing Greeks

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Meet the Greeks

- Delta – sensitivity to underlying's price
- Gamma – sensitivity to Delta
- Theta – sensitivity to time decay
- Vega* – sensitivity to volatility
- Rho – sensitivity to interest rates

$$C = SN(d_1) - N(d_2)Ke^{-rt}$$

C = Call premium
S = Current stock price
t = Time until option exercise
K = Option striking price
r = Risk-free interest rate
N = Cumulative standard normal distribution
e = Exponential term

s = St. Deviation
ln = Natural Log

$$d_1 = \frac{\ln\left(S/K\right) + \left(r + s^2/2\right)t}{s \cdot \sqrt{t}}$$

$$d_2 = d_1 - s \cdot \sqrt{t}$$

Warren Buffett & Coca Cola

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A Short History

- Coca Cola trading at $39/sh
  - Warren believes there is value to be found if it comes down
- Buffett sells 50,000 put options (5 million shares)
- Strike price of $35/sh for a sale price of $1.50/sh (initial profit of $7.5M)

Stock Goes Up:

- Buffett pockets the $7.5M and walks away from the trade satisfied

Stock Goes Down:

- Buffett makes $7.5M off the option premium and buys Coke for $35, where he was comfortable owning it anyway

Basic Options Strategies – Important

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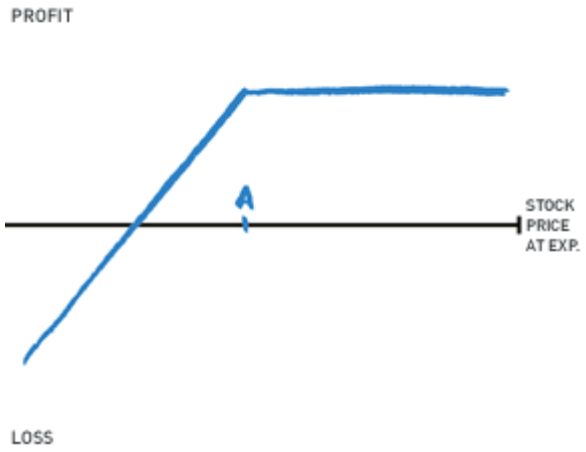
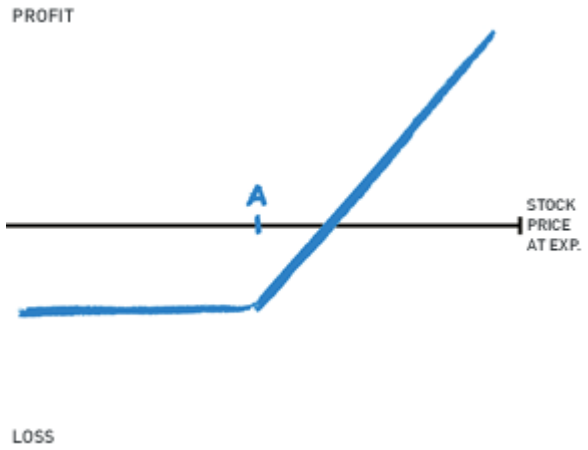
Covered Call

- Technique: buy stock, write call
- When to use: neutral/bullish outlook
  - Willing to sell if stock hits price target
- Payout diagram:



Married/Protective Put

- Technique: buy stock, buy put
- When to use: bullish outlook, but nervous on the downside
- Payout diagram:



Options Strategies, cont.

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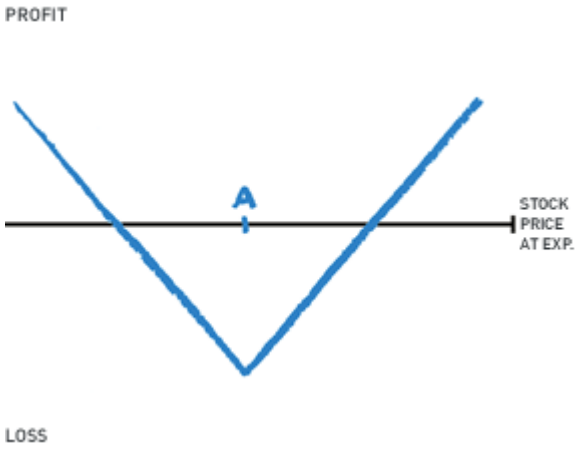
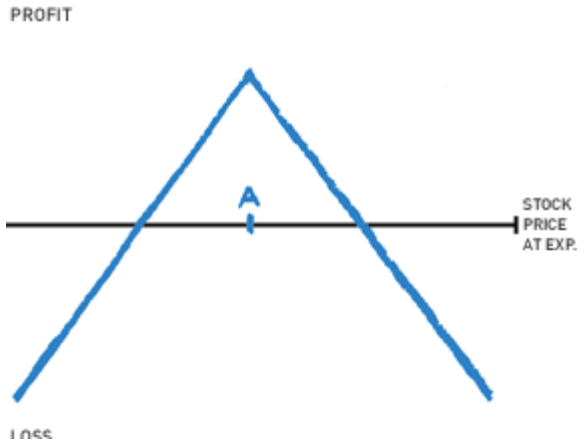
Long Straddle

- Technique: buy call, buy put
- When to use: high expected volatility
- Payout diagram:



Short Straddle

- Technique: write call, write put
- When to use: low expected volatility
- Payout diagram:



Options Strategies, cont.

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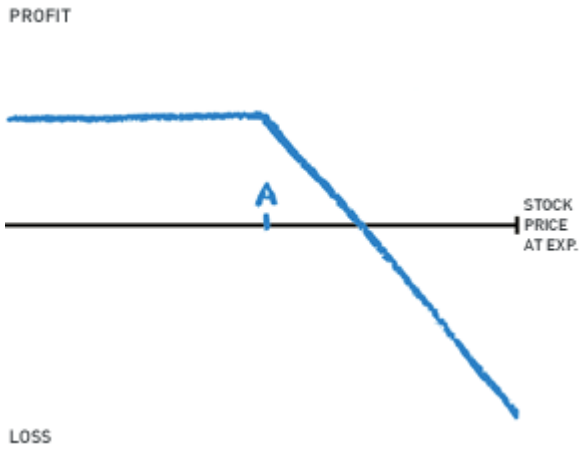
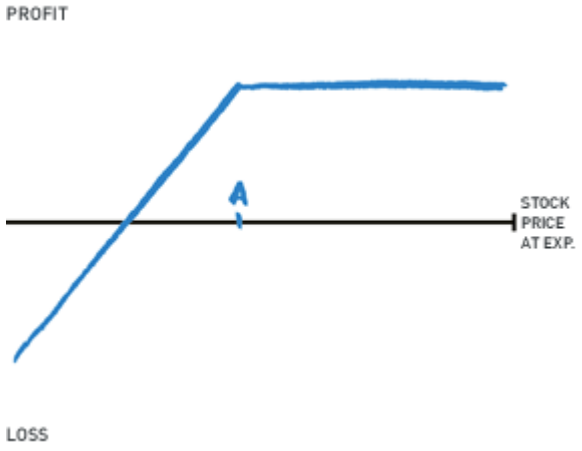
Short Call

- Technique: write call
- When to use: bullish/neutral
- Payout diagram:



Short Put

- Technique: write put
- When to use: bullish/neutral
- Payout diagram:



Questions?

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All Derivatives